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Evaluation of NDT technologies in support of CP 140 aircraft sampling inspection

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DEFENCE AND CIVIL
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Executive Summary

This evaluation was undertaken to identify possible nondestructive inspection systems that will fulfil the requirements of the CP140 Aircraft Structural Integrity Programme (ASIP). The CP140 aircraft is fast approaching its originally intended life expectancy and staff from the Directorate of Technical Airworthiness and the CP140 Aircraft Engineering Office are considering an extension. In that light, the third line support contractor (i.e., Industrial Maritime Products (I.M.P.) Group Limited) has identified critical areas via the Reliability Centered Maintenance methodology. More specifically, the common characteristic of these areas is the fact that they are not inspected under the current maintenance plan. As a result, data is lacking for a proper assessment of the aircraft structure. Hence, I.M.P. Group Limited has devised a number of Shop Instruction Notes (SINs) for the inspection of these areas that will require the use of nondestructive inspection systems. The proposed SINs call for the inspection of large surfaces, which preclude the use of most nondestructive inspection systems on a cost and time constraint basis. However, two systems were perceived as fulfilling the inspection requirements. They are the Magneto-Optic Imager (MOI) by PRI Research and Development Corporation and the D-Sight Aircraft Inspection System (DAIS) by Laser Measurement International (LMI) Inc. – Automotive Division. Both of these systems could provide for quick inspection of large surfaces. The evaluation documented in this report provides some insight on the advantages and disadvantages associated with both systems. Based on the evaluation results, the DAIS should enable the quick inspection of the overall aircraft structure and highlight areas with corrosion. However, this inspection systems will not cover all SINs requirements. This deficiency can only be addressed by the use of other inspections systems. Also, notwithstanding the results obtained with the DAIS, there is a requirement to confirm the presence and quantify the corrosion. This confirmation can be achieved by the use of conventional ultrasonic and eddy current techniques.

EVALUATION OF NDT TECHNOLOGIES IN SUPPORT OF CP140 AIRCRAFT SAMPLING INSPECTION PROGRAMME

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Introduction

1. Members from the Directorate of Technical Airworthiness and the CP140 Aircraft Engineering Office are assessing the CP140 estimated life expectancy. They have identified critical areas using the Reliability Centered Maintenance logic tree. However, due to the lack of data pertaining to the condition of the aircraft structure, the third line contractor (i.e., Industrial Marine Products (I.M.P.) Group Limited) has devised eight Shop Instruction Notes (SINs) for the inspection of areas not currently inspected for cracks and corrosion. The main focus is the detection of hidden corrosion which has been linked with the accelerated initiation and growth of fatigue damage.

2. This report addresses the selection of an NDI method for four of these SINs. In all cases, the problems identified are corrosion at the faying surfaces and cracking emanating from rivet holes. Specifically, the areas under considerations are:

SIN-202	Fuselage Skin Lap Joints
SIN-206	Wing Skin Panel Splices
SIN-210	Horizontal Stabilizer Plank Splices
SIN-211	Vertical Stabilizer Plank Splices

3. During initial discussions between the staff from the Directorate of Technical Airworthiness (DTA), the Nondestructive Officer from the Aerospace and Telecommunication Engineering Squadron (ATESS), the Research and Development Officer from the Air Vehicle Research Section (AVRS) and staff from I.M.P.Group Limited, two nondestructive inspection systems have been proposed for evaluation. These systems were perceived as possible solutions to the requirements detailed in the SINs. The technology evaluated can be described as follows:

DAIS - It is a patented method of visualizing surface distortions, depressions, or protrusions as small as 10 μm [1]. It is a real-time technique particularly applicable to rapid inspection of large surfaces. The optical set-up consists of a light source, a retroreflective screen, and the object inspected. If a flat surface with an indentation is inspected, the light striking the indentation is deflected. It then strikes the retroflective screen at a point removed from the light rays reflected from the area surrounding the indentation. The retroflective screen attempts to return all rays to the points on the inspected surface from which they were reflected. The screen, consisting of numerous glass beads, returns a cone of light to the surface instead. In its basic configuration, the technique is used directly as an enhancement to visual inspections.

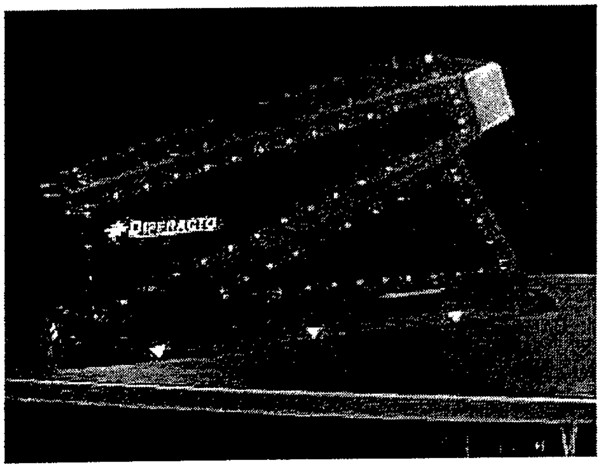


Figure 1
D-Sight Aircraft Inspection System from [2]

Magneto-Optic Imager (MOI) - The Magneto-Optic/Eddy Current Imager combines induced eddy current excitation with direct magneto-optic detection to produce real-time images of cracks, corrosion and other surface flaws. Disruptions of the induced currents caused by rivets, cracks, corrosion and other defects produce magnetic fields that are imaged directly by a magneto-optic sensor. The physical principle is that when a plane polarized light passes through glass in a direction parallel to an applied magnetic field, the plane of polarization is rotated [3]. Hence, a flaw would cause a variation of magnetic field and affect the images produced by the instrument.

Figure 2
Magneto-Optic Imager from [4]

Objective

4. The main objective of this report is to recommend a nondestructive inspection system to perform the inspections detailed in the SINs and identify any additional requirements that need to be met in order to address the SINs.

Evaluation Procedure

5. The initial selection of possible nondestructive inspection systems for the detection of corrosion in aircraft fuselage, empennage and wings was based on recommendations made by Major Kettenacker, Canadian Forces Nondestructive Testing Officer. Initially, staff from IMP Group Limited advocated the use of the MOI to satisfy the SINs requirements. On the other hand, the review of a previous United States Air Force assessment of nondestructive inspection systems for corrosion detection [5-6] revealed that the DAIS could also fulfil the SINs

requirements. Hence, the evaluation would help establish which of the two nondestructive evaluation technologies could best provide a quick assessment of the presence of corrosion in the aircraft structure.

6. The evaluation was carried out on several aircraft locations (Figures 3 through 6) as well as on coupons lent by the National Research Council (NRC) (Figures 7 though 11). For the on-aircraft evaluation, the initial intent was to inspect two aircraft, one painted and one stripped. However, due to scheduling and test flight requirements, only the unpainted aircraft (CP140117) was inspected. Notwithstanding this change in plan, carrying out the evaluation on the unpainted aircraft was more realistic since the nondestructive inspection will be carried out during the ASI survey phase i.e., when the aircraft is stripped.

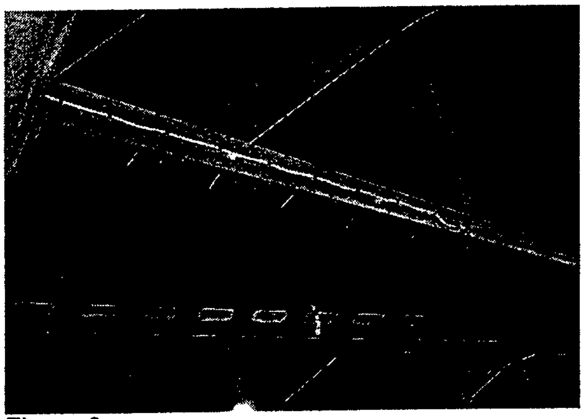


Figure 3
Inspection Area – Horizontal Stabilizer Plank Splices

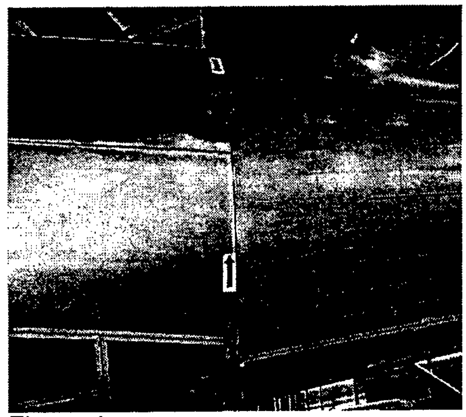


Figure 4
Inspection Area – Fuselage/Empennage Bulkhead

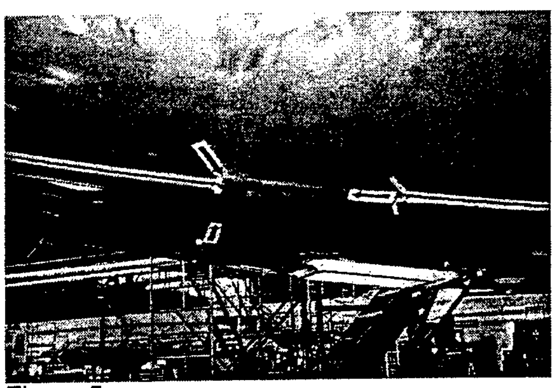


Figure 5
Inspection Area – Right Hand Fuselage Lap Splice

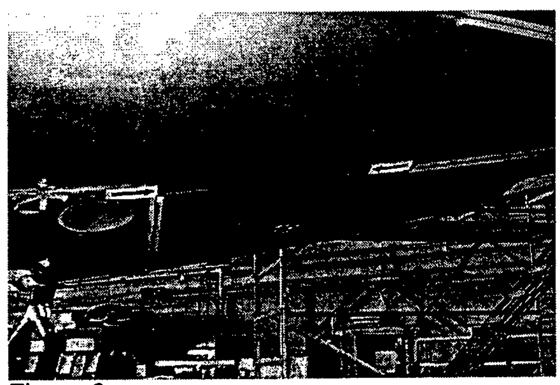


Figure 6
Inspection Area – Left-hand Fuselage Lap Splice

7. Specimens (also called coupons) were used for the evaluation of the nondestructive inspection systems. The specimens exhibited various levels of corrosion that enabled the demonstration and comparison of the ability of each inspection system to detect corrosion in various types of multilayer structures. In fact, the specimens were selected to either be similar to some of the joint construction on the CP140 or to present other constructions of possible interest. None of the fuselage specimens included in the selection have known cracks. These specimens, shown at Figures 7 through 11, are characterized as follows:

	ID No.	A/C type	Corrosion
a.	CL-600-6	CL600	None
b.	46L2	B727	Natural
c.	L10-12C	L1011	Accelerated
d.	707-1	B707	Natural
e.	CL-9	CL600	Accelerated

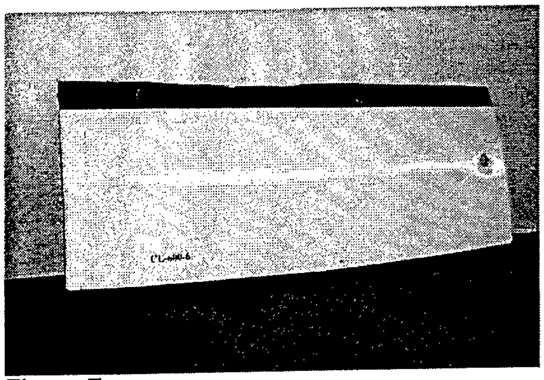


Figure 7
Coupon CL-600-6

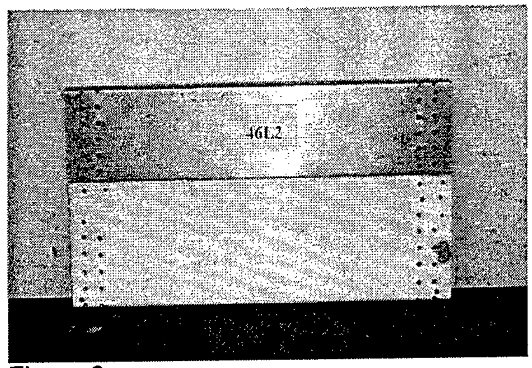


Figure 8
Coupon 46L2

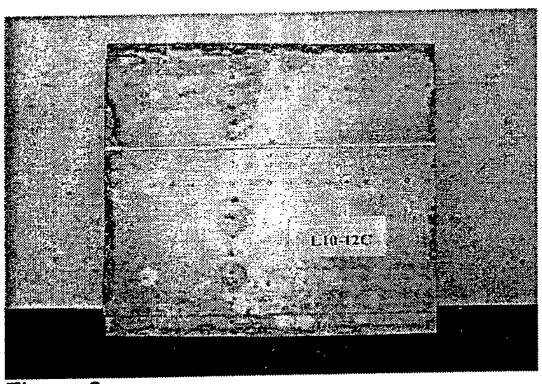


Figure 9
Coupon L10-12C

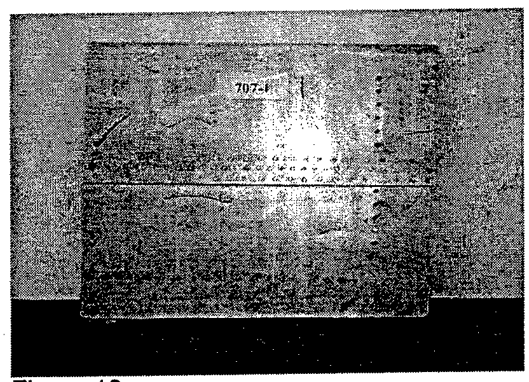


Figure 10
Coupon 707-1

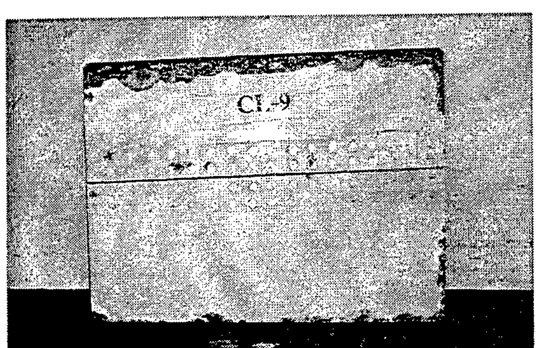


Figure 11
Coupon CL-9

8. The procedure followed for the on-site evaluation is as follows:

a. Mark coupons (with erasable marking pencils) at location where corrosion has been identified;

b. Mark aircraft skins (with erasable marking pencils) at location where defects have been identified;

c. Confirmation of defects / non-defects with conventional eddy current testing or ultrasonic testing;

d. Inspector records and organizes inspection data; and

e. Erase markings before the next vendor's inspection.

Testing Results

9. A list of criteria was established to provide a comparative basis for the two nondestructive inspection systems. The criteria are grouped in three categories i.e., Inspection, Analysis, and Support. The results presented herein are qualitative as time constraints precluded more detailed evaluation of the systems. The findings for each equipment are presented under headings representing the various set of criteria used for the evaluation.

MOI - Inspection

Set-up
Time required to set up: 10 minutes
Cable connections: High standard material used
Power: 115 Volts

Ease of use
Plug and Play

Portability
Cases are available for all of the components.

Speed of inspection (metres/min)
60 cm/min; however, multiple passes at various frequencies are required to detect cracks and corrosion at different depths or in different layers. The effect would be to increase the inspection time four-fold assuming only one pass is made at a given frequency.

During the evaluation, the sensor plate temperature appeared excessive. That could explain why the operator turned off the excitation at a certain point during the inspection likely to provide cooling. The effect of this cooling period is a reduction in the speed of inspection.

Ability to provide repeatable results
On the horizontal stabilizer, the MOI inspection indicated the presence of possible corrosion between two rivet rows. The location was not immediately marked and its exact location could not immediately be determined. In fact, it took approximately 10 minutes to get that particular defect indication without any changes to the system settings.

Versatility

The manufacturer claims the ability to detect cracks and corrosion. From the demonstration and the documentation provided [7], it appears that the smallest cracks that can be effectively detected are in the order of 0.050". However, the evaluation did not validate the ability to detect corrosion. Also from the demonstration, indications from a 0.010" material loss in a 0.060" plate were very hard to perceive. This means that defects less than 15% would not likely be detected with this technique during an on-aircraft inspection.

Maximum area of inspections

2" x 1¾"

MOI - Analysis

Ease of interpretation

The MOI did not detect any corrosion in the coupons. This result clearly showed the MOI limitation in light of the fact that the corrosion found in the coupons could be detected by a visual inspection. In general, the obtained images do not have a good contrast, their interpretation is not easy and demands a specialist having good practice [8]. In order to facilitate the visual detection of defects, it is advantageous to use algorithms to perform image processing to localize the defects (i.e., cracks and corrosion) [8]. However, this has only been done experimentally. Nonetheless, detection of defects with MOI is possible without image processing.

The second issue not addressed thus far is noise. Effectively, the detection of cracks can be achieved provided the surface inspected is relatively flat. Surface deformation, protruding rivets, and uneven sealant / gap between plates are noises which may impede the detection of corrosion and cracks. Also, in the case of ferromagnetic rivets, the residual magnetic field may obscure images of small cracks originating at the rivet. Hence, ferrous rivets, lift-off and gap variations can all lead to false calls.

Types of images

Data is projected on a helmet-mounted display or can alternatively be shown on a television screen.

Storage of data

Data can be stored on videotape. Images could also be digitized; however, a particular set up needs to be custom-made by the user.

Manipulation of stored data

If inspection is continuous and data is recorded, it may be very tedious to retrieve information.

Ability to quantify defects

Not possible

MOI - Support

Technical documentation

Unknown

Spare parts

Wear tape should be placed under the sensor to protect it against premature wear.

Knowledge required by trainee

The manufacturer claims that no prior knowledge is required by technicians operating the MOI. However, it is my assessment that the technician would need a good knowledge of eddy current technique for the proper interpretation of results.

Training length

Two training days.

Recurrence of training

Non recurring training required

Maintenance required

None

Specialized Tools

None

Manpower required

One or two man operation

Transportation and Shipping

Crates with foam cut-out can be used for transportation

Software modifications

Nil

DAIS - Inspection

Set-up

Time required to set up: 20 minutes
Cable connections: High standard material used
Power required: 115 Volts

Ease of use

This equipment requires the use of a turtle diagram that must be created prior to the conduct of an inspection. These diagrams can be provided by LMI – Automotive Division at a cost but could also be created with internal resources. In the latter case, there would be extensive work involving the use of computer-aided design to create wire diagrams used for the turtle diagrams. The technicians participating in the evaluation indicated that for the Challenger (CC144), it took approximately one month to produce the Turtle Diagrams. Similar times must be allotted for the creation of turtle diagram in the case of the CP140. However, time savings are possible since some turtle diagrams have already been developed for the P-3 Orion. It should be noted that this activity is only required for the first aircraft to be inspected, i.e. the same turtle diagram can be used for subsequent inspection.

Surface preparation is necessary for the inspection. Specifically, a highlighter must be applied on the surface to be inspected. The highlighter must be applied equally otherwise streaks will be visible on the image that may preclude the identification of defects.

Speed of inspection (metres/min)

Approximately 60 cm/min. With experience, the speed of the inspection can be increased for given inspections. During this evaluation, the operators selected to interpret images off-line after all of the frames had been captured. However, data interpretation could also be carried out simultaneously with the conduct of the inspection. In fact, the procedure suggested by technicians from 14 Air Maintenance Squadron (AMS) is to gather images on two or three lap splices, interpret findings and complete inspection reports. In their opinion, this working cycle provides a real-time assessment of the corrosion severity.

Ability to provide repeatable results

The ability to get repeatable results (i.e. same image) is dictated by the ability to relocate the DAIS hood at the same inspection location. This can be achieved with the Turtle diagrams.

Versatility

The main use of this type of equipment is in the detection of surface deformation such as pillowing due to corrosion. The ability to detect corrosion in thick structures (e.g., wing planks) is untested and unknown.

Maximum area of inspections

The DAIS hood covers a greater surface i.e., 24" x 6", than the area used for analysis (approximately 12" x 4"). The reason is that portion of the image generated with the DAIS i.e., at the fringes, is not reliable for detection purposes. This situation implies a requirement to overlap the DAIS images; however, the requirement for overlap does not affect the speed of inspection detailed earlier as this requirement was taken in consideration for the determination of that value.

DAIS - Analysis

Ease of interpretation

Material loss that is less than 5% can be detected with this method [9]. However, technicians operating this equipment require extensive experience with the equipment to adequately interpret the results. Distinct features need to be recognized to successfully distinguish between surface warp due to loading, surface repairs due to corrosion removal, or manufacturing defects. For these reasons, it is advantageous to initially get support / validation for the interpretation of inspection results.

Types of images

Images of the surface inspected show the surface deformation. The images have a given perspective that is dictated by the angle the camera makes with the mirror / surface.

Storage of data

Images are saved in BMP format. During an inspection, there are a large number of files created that require data archiving and configuration control. The archived data can be subsequently used to establish a baseline to determine the evolution of surface deformation due to corrosion product.

Manipulation of stored data

Images stored can be viewed with various software including, but not limited to , Paintbrush, MSPaint and Corel Draw.

Ability to quantify defects

Possible but the quantitative assessment is not simple to achieve without pattern recognition capability.

Image resolution

The image resolution is dependent on the computer screen and the software used for the imaging / assessment.

DAIS - Support

Technical documentation

Technical documentation is available with the equipment.

Spare parts

Rubber feet, head perimeter gasket and lamp bulb may be requiring replacement because of wear. However, the requirement for rubber feet and perimeter gasket is not perceived to be an issue that requires considerations for the ASI. There is also a requirement to purchase highlighter fluid used for surface preparation before an inspection. The yearly cost for the purchase of the highlighter fluid is approximately $500 US.

Prior knowledge required by trainee

Knowledge of corrosion and aircraft structure, limited knowledge of computer applications

Training length

The training required to adequately operate the DAIS is approximately one week. There are various options possible to get technicians knowledgeable in the operation of the system e.g., training by LMI Diffracto, support from NRC and 14 AMS for interpretation.

Recurrence of training

No formal recurring training required; however, continuous learning is essential for better inspection results interpretation

Maintenance required

Calibration of the DAIS is possible and can be carried out by the operators if accuracy is in doubt

Specialized Tools

The only specialized tool needed is the calibration plate purchased from LMI Automotive Division. The other tool required is a squeegee for the preparation of the surface for inspection.

Manpower required

By experience, 14 AMS technicians have found that operating DAIS working overhead is more effective with three people. Two people hold the hood while the other operates the computer and records the information. Otherwise, for flat surface such as wings, two people are sufficient to perform the inspection.

Transportation and Shipping

The DAIS is easily transportable in a metal box approximately 3'x2'x2' with foam cut-out.

Software modifications

Supported by LMI – Automotive Division. However, comparison between previous inspection and latest inspection is not currently possible with the software used by DND at 14 AMS; however, they intend to create a database to achieve this goal. It should also be noted that the software is in Windows 3.1. No update on that from is scheduled in next few years.

Discussion

Comparison Between Evaluated NDT Systems

10. A comparative table showing some of the evaluation results is provided in Table 1. As can be seen, each instrument has different capabilities, advantages and limitations. The following discussion will compare the demonstrated ability of each of two systems to detect corrosion.

	MOI	DAIS
Set-up Time (minutes)	10	20
Manpower	1 to 2	2 to 3
Speed (cm/s)	15	60
Detects Corrosion	Yes (15% material loss or greater)	Yes (5% material loss or greater)
Data Storage	Analog (video tape)	Digital
Training	2 days	7 days

Table 1
Summary of Evaluation Results

11. The inspection of coupons with the MOI did not highlight any areas with corrosion. On the other hand, corrosion was detected for two areas on the left-hand fuselage lap splice and the horizontal stabilizer. A subsequent validation of these indications with conventional ultrasonic technique pointed to a fault-free structure. Hence, during the evaluation, the MOI was unable to detect the presence of corrosion. This is not to say that MOI cannot detect corrosion, however, the extent of corrosion required for positive identification must be greater than 15% material loss. In this case, the indication for this type of defect would be a shadow going through the screen as the hand held imager is scanned across an area with a defect. This type of indication is difficult to visualize, if at all possible, for corrosion in the initial stages. Also, lift-off and change in gap affects the eddy current induced in the test object. This effect creates false indications in the images seen with the MOI.

12. The second nondestructive inspection system evaluated (i.e., the DAIS) was able to identify the presence of corrosion in coupons (Figures 12 through 16). In most cases, the DAIS correctly identified areas with corrosion. However, in one instance, the DAIS indicated the presence of very light corrosion in two different areas of coupon CL-600-6 (Figure 12). This coupon was characterized by NRC as having no defect. This assessment clearly illustrates the fact that the ability to correctly assess a structure is dependent on the inspector's interpretation.

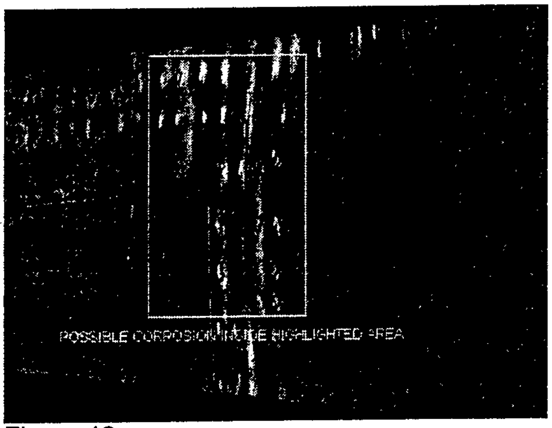


Figure 12
DAIS Results for CL-600-6

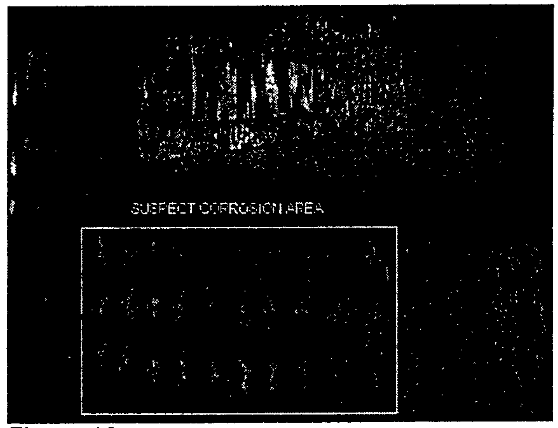


Figure 13
DAIS Results for 46L2

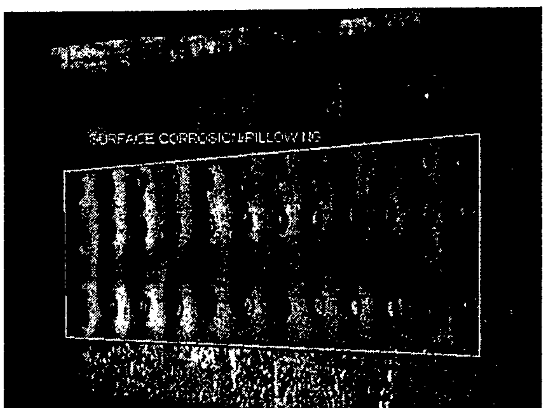


Figure 14
DAIS Results for L10-12C

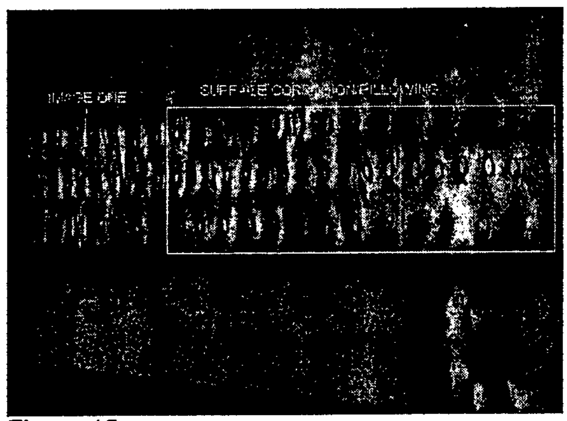


Figure 15
DAIS Results for 707-1

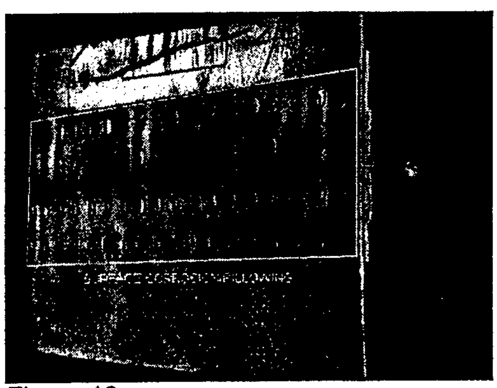
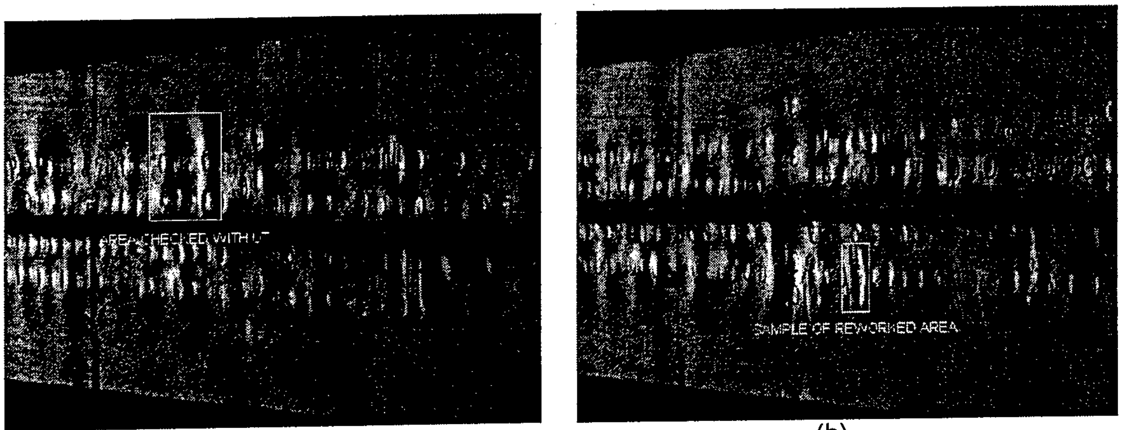


Figure 16
DAIS Results for CL9

13. As to the aircraft fuselage inspected with the DAIS, some areas were highlighted as suspect areas and were found to be without defect using the ultrasonic technique. However, it should be noted that subsequent analysis showed that some of those false calls were areas previously repaired. It should also be pointed out that given that the MOI is more sensitive than the industrial commercial ultrasonic testing (UT) instrument used, very light corrosion e.g., 2-5% would show up with the DAIS but not with the UT instrument.



(a) (b)

Figure 17
DAIS Results for Horizontal Stabilizer Plank Splices (a) Rivet Row 1 (b) Rivet Row 2

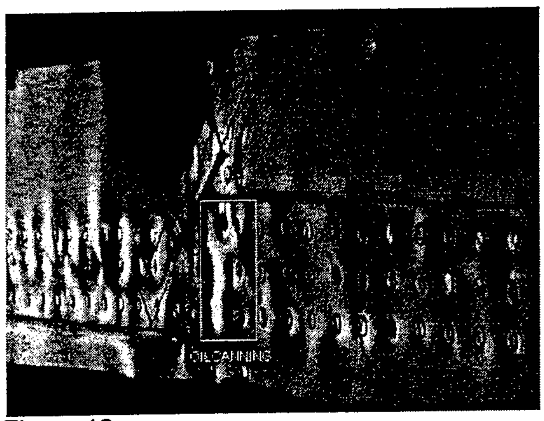


Figure 18
DAIS Results for Fuselage/Empennage Bulkhead

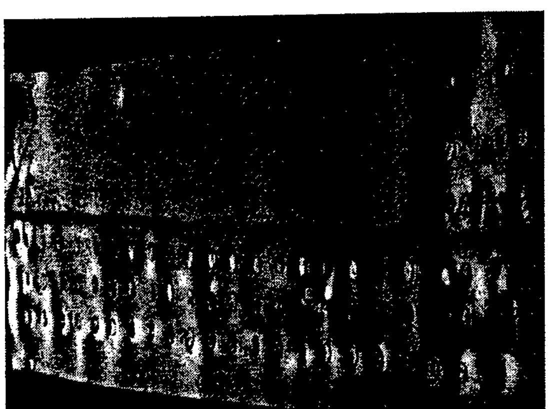


Figure 19
DAIS results for Right Hand Fuselage Lap Splice

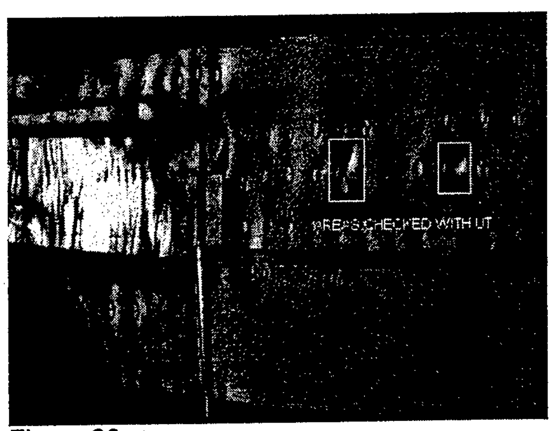


Figure 20
DAIS Results for Left-hand Fuselage Lap Splice

14. Hence, the DAIS provides the capability to determine the location of corrosion. The limitation is that the method requires the interpretation of the images captured during the inspection by experienced personnel. Oil canning, manufacturing defects, previous repairs will influence the readings taken for the component. The clear advantage is that it is possible to carry

out comparison with previous inspection provided that DND develops or pays for the development of a software application to accomplish this task.

NDT Systems vs SINs Requirements

15. The DAIS is only part of the solution. As shown in Table 2, the DAIS does not fulfil the corrosion detection requirements for all of the SINs. Specifically, the corrosion detection capability of the DAIS for the Skin Panel Splices is unproven and may not be sufficient for this inspection. The thickness of the layers in this type of structure is much greater than for fuselage skin lap joints. As a result, the deflection due to corrosion product may not cause the same sort of surface deformations seen for fuselage skin lap joints. Hence, a second technique needs to be used for SIN 206. Specifically, a UT C-scan inspection is believed to be the best means to achieve the requirements. The UT C-scan inspection will show thickness variation but will also enable the quick and accurate determination of defective areas in the faying surfaces of the structure. If there is a bond (e.g., sealant) between the surface, it may be possible to detect material loss in both layers; otherwise, only the exterior layer will be characterized.

	DAIS	MOI	UT Scan	EC Scan
SIN 202 Fuselage Skin Lap Joints	Yes	No	Yes	Yes
SIN 206 Wing Skin Panel Splices	No	No	Yes	No
SIN 210 Horizontal Stabilizer Plank Splices	Yes	No	Yes	Yes
SIN 211 Vertical Stabilizer Plank Splices	Yes	No	Yes	Yes

Table 2
Ability of Nondestructive Inspection Systems to fulfil SINs requirements

16. Although, the DAIS provides an indication of the presence of corrosion, there is still a requirement to have a confirmation performed on the suspect areas. This confirmation can be achieved using conventional eddy current or ultrasonic techniques depending on the structure being inspected. Although the UT instrument can provide a quantitative assessment of the first-layer material thickness, it may not be sufficiently precise and may not provide any indication of the second-layer characteristics. The best technique for the task is the eddy current technique. The eddy current technique, employing impedance plane instruments, is useful for detecting thinning due to corrosion in a thin multilayer structure. However, when thinning and bulging (interface separation) occur together, it causes some difficulty for measuring the thickness of the remaining material. However, this problem can be solved by using a two-frequency C-scan eddy current procedure that is intrinsically more reliable than the impedance plane eddy current procedure [6,10]. It should be noted that unless the inspection process is fully automated, the proficiency of the inspection personnel is the largest variable affecting inspection reliability. Hence, it is considered essential to have a scanning system to perform the inspection i.e., to quantify material loss in any layers of the structures identified by the SINs.

17. Figure 21 provides the type of results that can be obtained with a C-scan eddy-current technique. The results shown here are for coupon 46L2. As can be seen in the figure below, there is a variation in the color between the rivets located in the center row. It goes from bright blue to green. From the calibration, a 0.001" represents a one-color change as shown in the Calibration legend. Therefore, it is possible to assess that specimen 46L2 has a 3-10% material loss in the central region of the specimen. This result confirms the DAIS results shown at Figure 13 .

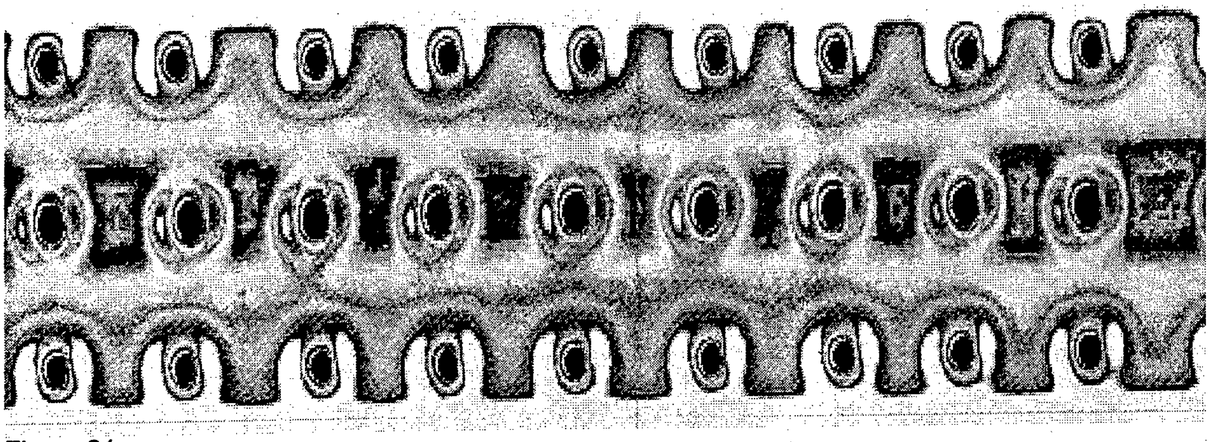
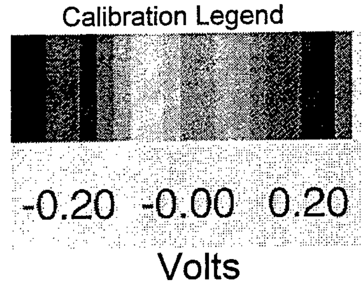


Figure 21
Eddy-Current C-scan Results

Calibration Legend



Recommendations

18. The detection of corrosion on the CP140 is mainly done by visual inspection. Specific signs of corrosion include local bulging of the skin adjacent to the fasteners, cracked or missing fastener heads, or the presence of corrosion product. To improve on the detection of corrosion, DAIS can be used to provide an indication of the surface deformations due to various causes including deformation due to the corrosion product. This equipment will provide a quick means to identify areas with corrosion.

19. Confirmation of the DAIS results may be carried out with conventional UT techniques, however, the results obtained will only provide characterize the material loss in the first layer of the structure being inspected. For the characterization of both layers, it is necessary to use eddy-current techniques. In fact, previous evaluation of nondestructive inspection systems for the detection of corrosion indicated that an inspection procedure that takes advantage of eddy current and enhanced visual technologies may be a significant improvement over visual inspection alone [6]. Therefore, it is recommended to acquire eddy-current C-scan capability to quantify corrosion in the CP140 structures detailed in SINs 201, 210 and 211.

20. Finally, it is unclear whether the DAIS can provide an indication of the material loss in the case of the wing skin panel splices. In this case, a project should be initiated to have ATESS perform a UT C-scan inspection using their refurbished PANDA system. It would be advantageous to also inspect these splices with the DAIS to build a database to determine whether this technique can be used for the detection of material in splices composed of thick layers.

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This evaluation was undertaken to identify possible nondestructive inspection systems that will fulfil the requirements of the CP140 Aircraft Structural Integrity Programme (ASIP). The CP140 aircraft is fast approaching its originally intended life expectancy and staff from the Directorate of Technical Airworthiness and the CP140 Aircraft Engineering Office are considering an extension. In that light, the third line support contractor (i.e., Industrial Maritime Products (I.M.P.) Group Limited) has identified critical areas via the Reliability Centered Maintenance methodology. More specifically, the common characteristic of these areas is the fact that they are not inspected under the current maintenance plan. As a result, data is lacking for a proper assessment of the aircraft structure. Hence, I.M.P. Group Limited has devised a number of Shop Instruction Notes (SINs) for the inspection of these areas that will require the use of nondestructive inspection systems. The proposed SINs call for the inspection of large surfaces, which preclude the use of most nondestructive inspection systems on a cost and time constraint basis. However, two systems were perceived as fulfilling the inspection requirements. They are the Magneto-Optic Imager (MOI) by PRI Research and Development Corporation and the D-Sight Aircraft Inspection System (DAIS) by Laser Measurement International (LMI) Inc. - Automotive Division. Both of these systems could provide for quick inspection of large surfaces. The evaluation documented in this report provides some insight on the advantages and disadvantages associated with both systems. Based on the evaluation results, the DAIS should enable the quick inspection of the overall aircraft structure and highlight areas with corrosion. However, this inspection systems will not cover all SINs requirements. This deficiency can only be addressed by the use of other inspections systems. Also, notwithstanding the results obtained with the DAIS, there is a requirement to confirm the presence of corrosion. This confirmation can be achieved by the use of conventional ultrasonic and eddy current techniques.

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